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EDITORIAL

THERE'S BUT A TWINKLING OF A STAR BETWEEN A MAN OF PEACE AND WAR

ON a winter's night, when the sky is clear and the heavenly bodies are displayed like sparkling gems upon a velvet cloth, a spectator need seek no excuse for emotion if he be overawed by the immensity of space and humbled by the majesty thereof. He may realise, and perhaps for the first time, that the world in which he lives and which has seemed to be so large, so solid, and so permanent, is only a speck in an infinite and ordered array and the measure of his life a whiff in the eternity of time.

Throughout the ages men have looked at the stars and strained to decipher their course and meaning. In consequence we know something of the astral plan that is within the range of vision and we can delineate its past and present design and foretell much of its future course and mode, for sages of many generations have surveyed the heavens and recorded their observations. Our knowledge of that which is within the range of the human vision is limited, we do not know its compass and must presume that its boundaries are limitless and of an infinity that is beyond human comprehension. The term "The Universe" has been coined to name this stupendous affair and throughout the ages philosophers and theologians have pondered and argued in an effort to devine the scope, the meaning and the limits of the magnificent design. Their prognostications make a fascinating story but it is one which is founded on concept and conjecture and not on factual truth. In more recent times mathematicians have joined the fray and, as all natural things follow an ordered plan, these men have been able to unravel some of the code and disclose a considerable amount of factual information by virtue of their mastery of the science of signs and figures. As physical science has developed some of the secrets of previously unchartered fields have been uncovered and it is

remarkable that many of the conjectures of the wise men of the past have been shown to have substance in fact. During the last few months physicists have prepared and launched mechanical contrivances into the realms of space. These have sailed to great heights and orbited around the earth and conformed to the laws which govern natural satellites. By the aid of electronic devices these man-made satellites are able to register and relay information concerning the manner and time of their motion and their environment. Knowledge of things celestial is accumulating at great pace and there are some who believe that interplanetary travel and communication is not far around the corner. One might ask are these new ventures worth while, will this expansion of the wonders of physical science bring any benefit to mankind? These thoughts are echoed throughout the world and men's souls are troubled for the adventure has been urged and sponsored, in the first instance, by men of arms who seek the means for new and unique methods of destruction. If research remains in their unfettered hands many men will be doomed to destruction and civilisation may perish, for throughout the known history of the human race new weapons have not been devised for æsthetic purposes, someone has called for a test to see if they would fulfil the prime purpose for which they were devised.

The light which has been encircling the world for the last few weeks can be a signal of dire times to come or it may proclaim a new era of world-wide prosperity and happiness. To us is the choice. If all men of good will and compassion, no matter of what their race or creed, stand firm in their resolve to use science only for the benefit of sentient nature, this thing which has roused and startled the world of 1957 may be a signal of good tidings as was the star of Bethlehem nearly two thousand years ago. As Christmas approaches let us remember the terrible errors of the past and plan aright for a happy, peaceful and glorious future.

REMEMBER

Two men, one old the other young, were sitting by a miserable fire in a meanly furnished room on a cold December evening. They were veterinary surgeons and the youngster was making one of his periodical calls on his old master who, a victim of generalised rheumatoid arthritis, was unable to work. The old man was confined to his room and spent many hours alone and looked forward with pleasure to the visits of his young friend who now owned the old practice. They would talk of men and things and a good deal of " shop ". The young man was worried for the old man's resources were so meagre that he could not afford the joy of a reasonable fire.

Young Man: How is it, my old friend, that, after being in practice for 40-odd years, and working as hard as you did, your financial state is so low that you have to live in this miserable way? If I carry on the self same practice for 40 years I think I shall be able to provide reasonably well for my retirement.

Old Man: I hope that you can make provision so that you will be able to live in comfort when old age or sickness comes. You ask why I am so impoverished? The answer is a simple one. Although I practised for 40 years

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and, relative to the time, the practice was a good one, my financial reward was poor, when judged by modern standards, and it was only by the strictest economy that I could pay my way. There was rarely any surplus to put by for a rainy day. As long as I could work I could manage to get by but I lived in dread of the future and especially of old age and illness. My small savings have lost much of their purchasing value and this had made my condition worse.

Young Man: I think that yours is a terrible plight. I am in the same profession as you were, I practise in the same place and there has been no great increase in the number of the clients, yet my circumstances are good. I can employ an assistant, I do not need to watch every penny and I can provide for the future reasonably well.

Old Man: Circumstances have changed completely. No one who has practised only during the last 15-20 years can have any idea how near to the bone most veterinary surgeons had to live in previous times. It was the same story with most professional men. We worked hard but the rewards were not great even when considered in relative terms and there was little to spare to provide against illness or old age. That is why the Benevolent Funds were established so that the mites of those at work could help to give a little comfort to those in adversity. I am glad that I subscribed to the veterinary benevolent societies' funds whilst I was at work for now I could not exist without their help. The grant which they have given me makes all the difference to my mode of life. I am assured of the essential necessities of life and the gifts which I receive twice a year help to replenish my wardrobe and provide for the odd luxury. My plight is also that of many more. In the majority of cases it is through no fault of our own. It is just that we, like many other professional men, lived and worked for 40-odd years in a time when it was very difficult for the average man to provide adequately against adversity. The fall in the purchasing power of money and the great increase in the cost of food and other essentials has added to our difficulties.

Young Man: Do you think that such times may come again?

Old Man: It is quite possible, good times and bad times have always alternated. My advice to you, who live and work in this prosperous era, is, make hay whilst the sun shines but provide against a rainy day. Bad times may come again. Who knows? Some young man may come to see you as you have come to see me. I hope that never comes to pass in your case, but illness, ill-luck and old age will always take their toll. There will always be people in need of help, so support the benevolent funds to the utmost of your ability just in case that you, or some dear friend, may be as I.

GENERAL ARTICLES

PRECIPITIN AND INTRADERMAL TESTS IN ASCARIS LUMBRICOIDES INFECTION IN PIGS*

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SPECIFIC antibodies have been detected in humans infected with *A. lumbricoides* by several workers; Ghedini (1907), Usami and Kamada (1921) and Isbecque (1924) used the complement fixation test and Coventry and Taliaferra (1928) utilised the precipitin reaction. Such antibodies were searched for unsuccessfully in infected pigs by Busson (1911) who used the complement fixation test. This is not surprising in view of the recently demonstrated procomplementary action of pig serum (Boulanger, 1954).

Hypersensitivity to *A. lumbricoides* is well recognized and cutaneous tests demonstrating this have been used extensively in humans as diagnostic aids. Notable workers in this field have been Weinberg and Julien (1911), Fülleborn (1926), Coventry and Taliaferro (1928), Borlin (1946) and Uner (1952). Similar work with pigs was undertaken by Wilkening (1937).

The almost universal findings have been that such tests showed lack of correlation between immunological reactions and the presence of infection as judged by the presence of ova in the fæces.

Fülleborn (1926) and Maternowska (1938) ascribe this in the case of intradermal tests to the persistence of skin hypersensitivity for long periods. Such a persistence of hypersensitivity is not an unusual feature of this aspect of immunity.

The use of post mortem examination as a criterion for determining infection with *Ascaris* can give an indication not only of the present but also the past history of parasitism. The results of skin and precipitin tests on pigs which were subjected to a detailed examination post mortem subsequently form the basis of this report.

Materials and Methods

Skin Test Antigens

Since Canning (1929) has demonstrated that the intestinal tissue of *Ascaris* is the most species specific and Oliver-Gonzalez (1946) has shown that a saline extract of the intestine was satisfactory in provoking anaphylaxis in sensitised guinea pigs, the intestine was chosen as the tissue to use as a specific antigen. The intestine was removed from both male and female worms, cleaned of contents, washed and dried for 2 days at 37° C. This was subsequently pulverised and then extracted in 0.5 per cent phenol saline in the proportion of one gramme of material to 100ml. of saline. Extraction was carried out for 10 days at 4° C. After centrifugation the supernatant fluid was stored in ampoules at −10° C.

Control solutions consisted of phenol saline and a sterile 1 per cent solution of peptone in phenol saline.

* This work was carried out at the City of Edinburgh Abattoir Laboratory, Gorgie, Edinburgh, during the years 1949-1951.

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Injections were made with "Record" type dental syringes. After thorough cleansing of the site, 0.1 ml. of the specific antigen was injected intradermally into the loose fold of skin at the base of the left ear, the right ear being used similarly for the control solutions.

The pigs were examined 15 and 45 minutes after injection and again at 18 hours. Measurements of reactions were made with the aid of callipers graduated in millimetres.

Some pigs were injected with the antigen after it had been heated at 100° C for 30 minutes and others were injected with the polysaccharide antigen used in the precipitin tests.

TABLE 1
Distribution of Positive Precipitin Reactions in Pigs showing varying Degrees of Chronic Focal Interstitial Hepatitis

	Degree of Chronic Focal Interstitial Hepatitis							
	Slight		Moderate		Marked		None present.	
Animals in Each Group	60		19		11		3	
Serological Reaction.	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
with 1 1000 Antigen	9 (5)	51 (12)	9 (1)	10	8 (2)	3	-	3
WITH 1 - 2000 Antigen	1 (1)	59 (16)	3	16 (1)	2 (1)	9 (1)		3
WITH 1 - 4000 Antigen	-	60 (17)		19 (1)	1 (1)	10 (1)	-	3

Excludes doubtful reactions, includes +++, ++, + reactions. The figures in parenthesis indicate the number of pigs which had mature *A. lumbricoides* in the small intestine.

Precipitin Test Antigens

Campbell (1936) described the preparation of a purified polysaccharide component of *A. lumbricoides* which reacted specifically with antisera produced against the whole worm. Later Campbell (1937) improved the method and claimed that a polysaccharide was produced which could differentiate the human and the pig strains of *A. lumbricoides*. Oliver-Gonzalez (1946) further demonstrated that such a polysaccharide preparation could be used to detect antibodies in infected animals. Such an antigen was used in the present work and was prepared as described by Campbell (1937). The yield of polysaccharide from 100 grammes of fresh whole worm was 140 milligrammes. This was dissolved in saline to give a concentration of 1 in 1,000.

Serum

Blood was obtained from pigs as they were slaughtered. The serum was allowed to separate overnight and was tested the following day after being centrifuged.

Precipitin Tests

Interfacial tests were carried out in narrow tubes (1.D.4m.m.). Antigen in 1 in 1,000, 1 in 2,000 and 1 in 4,000 dilutions was layered over samples of undiluted serum so as to produce a clear line of demarcation. The tubes were incubated at

room temperature for one hour and were then examined. A positive reaction was adjudged when a fine ring or plane of precipitate occurred at the interface of the two fluids. The degree of precipitation was estimated from the density of the ring and arbitrarily designated +++, ++, + or doubtful.

TABLE II

Percentage of sera from Animals with different degrees of Chronic Focal Interstitial Hepatitis which gave positive precipitin reactions with 1-1000 antigen.

	Degree of Chronic Focal Interstitial Hepatitis		
	Slight	Moderate	Marked
Positive Sera	15%	47%	72%
Number Examined	60	19	11%

Post-Mortem Examination

Pigs which had been skin-tested were slaughtered individually. The carcase and viscera of these animals and of those from which blood had been taken for precipitin tests were examined as follows.

The liver was examined for signs of chronic focal interstitial hepatitis (" white spot " or " milk spot ") which Oldham and White (1944) ascribe to the migration through the liver of the larvæ of *A. lumbricoides*. The lungs were palpated and incised to detect *Metastrongylus spp.* infection. The small intestine was examined throughout its length for *A. lumbricoides*. The cæcum and colon were examined for *Trichuris* and *Œsophagostomum sp.* The rest of the carcase as viscera was examined for other helminth and bacterial disease.

Results

Precipitin Reactions

The sera of 93 pigs were examined. The distribution of the positive reactions with the various antigen dilutions and the incidence of chronic focal interstitial hepatitis are presented in Table I. Table II shows the incidence of positive reactions with the 1 in 1,000 antigen dilution compared with the severity of the focal interstitial hepatitis.

It was evident from these results that the majority of pigs possessed some degree of chronic focal intestitial hepatitis, but of 93 pigs only 20 carried mature worms in the bowel. However, this latter figure may not represent the true incidence of carriers of mature worms in bacon weight pigs since the previous history, prior to arrival at the slaughterhouse was unknown and they may well have been treated with anthelminthics. Whether or not this occurred would not appear to affect the issue since pigs carrying adult worms showed no serological reactions and no correlation existed between the presence of antibodies in the serum and the presence of adult worms in the intestine.

There is, however, a definite indication that positive sera are more frequent from pigs with more than slight chronic focal interstitial hepatitis. Other helminth infestations such as *M. apri* and *O. dentatum* were present in some animals but these did not appear to influence the reactions.

Intradermal Reactions

The immediate response to the injection of both solutions (Test and Control)

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was the production of a wheal 3 to 4 m.m. in diameter. Within a few seconds this had increased in area and had become flattened, in addition a zone of erythema had begun to develop increasing the diameter of the affected area to 6 to 8 m.m. In the case of the control solution this reaction usually disappeared within 10 minutes. When the pig showed hypersensitivity to the ascaris extract the early reaction was usually replaced within 45 minutes with an area of discolouration varying from red to deep purple. At the point of the injection the skin sometimes became black. The abnormal colour which varied in diameter, usually disappeared within 6 hours but where the reaction was marked discolouration was still obvious after 18 hours.

TABLE III

Frequency Distribution of Reactions occurring in Pigs to the Intradermal Injection of 1–100 Saline Extract of *A. lumbricoides* intestine.

	POST MORTEM FINDINGS							
	Chronic Focal Interstitial Hepatitis							
Type of Reaction	Slight	%	Moderate	%	Marked	%	No Evidence of Infection	%
Negative or very slight	32 (9)	29	7 (2)	16.2	3 (1)	27.2	11	68.7
Purple Area or Wheal 5-9 m.m	25 (3)	22.7	8 (1)	18.6	-	0	3	18.7
Purple Area or Wheal 10-19 m.m	37 (14)	33.6	21 (9)	48.8	1 (1)	9	-	0
Purple Area or Wheal 20 m.m & over	14 (2)	12 7	4 (1)	9.3	4	36.3	2	12 5.
Delayed Reaction Purple Area or Wheal 20m.m. & over	2	1 81	3	6 9	3	27.2		0
TOTALS	110 (26)		43 (13)		11 (2)		16	Total = 180

Figures in parenthesis indicate the animals which had mature *A. lumbricoides* in the intestine.

In some cases the original wheal increased in size, being surrounded by erythema. The increase in wheal size was maintained for about an hour.

Where no hypersensitivity to Ascaris existed the specific antigen produced only a transient wheal with a small area of erythema, both of which disappeared within an hour.

In a few cases no reaction to the specific antigen was apparent in one hour but followed several hours later, being a " delayed type " of reaction. In these cases a reaction was evident at 18 hours and consisted of a central dark red or purple point surrounded by a wide zone of deep erythema.

Skin tests were made on 180 pigs. The distribution of the reactions, percentage of pigs reacting and the incidence of infected pigs and of chronic focal interstitial hepatitis are presented in Table III.

As with the precipitin reactions, there was no correlation between the pigs showing positive skin reactions and the presence of adult ascarids but there was an indication that as the degree of chronic focal interstitial hepatitis increased the incidence of positive reactions increased.

Tests carried out with a heated extract of Ascaris showed results comparable to those obtained with unheated material.

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The polysaccharide antigen was less satisfactory than the saline (protein) extract, the reactions being of a much lower order.

Other helminth infestations such as *M. apri* and *O. dentatum* did not appear to influence the reaction.

Discussion

That there is no correlation between a positive precipitin reaction and the presence of adult worms is in accord with the findings of Coventry and Taliaferro (1928) in Hondurean natives. The correlation between positive precipitin reaction and the degree of chronic focal interstitial hepatitis is of interest. Since such liver lesions are associated with the migratory phase of the parasite it is tempting to suggest that this phase is primarily, if not wholly, responsible for the stimulation of antibodies. That the migratory phase of *A. lumbricoides* will stimulate antibody production has been demonstrated by Coventry (1929) and Oliver-Gonzalez (1943 and 1946) in small laboratory animals in which the parasite does not progress to maturity. It remains to be demonstrated whether the 4th and 5th stage larvæ developing in the intestine are capable of stimulating an antibody response. This present investigation has shown the adult worms are not associated with an antibody response so that any antibody found in the serum would be induced during the early larval stages (2nd and 3rd) migrating in the liver and lungs or the later stages (4th and 5th) developing in the bowel. The former is known to occur in laboratory animals and there is no reason to expect that this would be otherwise in the final host. The present investigation would confirm this. The evidence would tend to suggest that precipitins are associated with the early stages of infection and would be maintained by reinfection. In the absence of reinfection and hence stimulation, precipitins will wane and cease to be demonstrable.

This is in contradistinction to the skin sensitizing antibodies which result in prolonged sensitivity of tissues. This is evident in the present investigation since 74.4 per cent of pigs showed positive skin reactions compared with 30 per cent. showing positive precipitin reactions. The presence of adult worms in the bowel was not of necessity associated with the production or maintenance of sensitivity and this is in accord with the finding of Wilkening (1937). The association between the severity of chronic focal interstitial hepatitis and the incidence of positive skin reactions is not so marked as that noted in the precipitin tests.

Allergic tests are well known to be superior to the *in vitro* conventional serological tests for the detection of antibody and consequently even very light infections of Ascaris may sensitize a pig sufficiently to react to an allergic skin test. This in itself is sufficient to explain the lack of correlation between skin and precipitin tests in Hondureans noted by Coventry and Taliaferro (1928). This belief is supported by the fact that some pigs, apparently free from infection, gave positive skin reactions.

The use of chronic focal interstitial hepatitis as a criterion of infection having taken place may be misleading in that other pathological entities may produce similar lesions (e.g. Virus hepatitis, *C. tenuicollis*). Nevertheless, the incidence of positive reactions increases with the severity of the focal hepatitis and work on comparable lesions in rabbits and guinea pigs (unpublished) suggests that the lesions

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are associated with reinfection and are the reaction of a sensitized liver to invading larvæ. The results of the skin tests would indicate that this is also applicable in pigs.

In eight animals an immediate type of reaction was missing being replaced by a delayed type of reaction. Frank (1940) reported a similar type of reaction in humans infected with immature Ascarids, that is during the early phase of infection. Similar delayed reactions have been recorded in the early stages of human trichinosis by Spink (1937) who further demonstrated that the skin reaction became immediate in type later in the infection. Similar reports have been made by MacNaught, Beard and Myres (1941) and Speath (1942). A similar course of events is seen in laboratory animals sensitized to foreign protein (Jones and Mote, 1934, Mote and Jones, 1936, and Dienes, 1936) in which the sensitivity develops and wanes as a delayed reaction but is established as an immediate reaction.

The eight animals in this survey which showed a delayed reaction were possibly in the later stages of sensitivity when the reaction was waning. Maternowska (1938) states that skin reaction may become two phase (i.e. both immediate and delayed in type) and suggests that absorption of helminth protein from the bowel may stimulate the delayed type. No immediate reaction was seen in these eight pigs but the migration of newly acquired larvæ may have supplied the protein for the reaction if the theory of Maternowska is accepted.

The reactions with the heated antigen were identical with those induced by the unheated antigen, being indicative that the essential antigen is heat stable. This is in accord with the finding of Fülleborn (1929) and Ransom, Harrison and Couch (1924).

Summary

Skin and precipitin tests were made on 273 pigs which afterwards were examined *post-mortem*. No correlation existed between the presence of positive reactions and the presence of adult worms in the bowel but the incidence of positive reactions increased with the severity of chronic focal interstitial hepatitis.

The significance of positive reactions in relation to their development is discussed.

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COMPARISON OF THE VASCULAR SUPPLY TO THE VIRGIN AND POST GRAVID UTERUS OF THE PIG, OX AND SHEEP

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Introduction

THIS work has been carried out with the object of assisting in the identification of virgin and post gravid uteri removed from carcases after slaughter.

The importance of being able to make this identification with accuracy was pointed out to us by Mr. John Norval, Chief Veterinary Inspector of Edinburgh.

It has been known for carcases of cow, sow and ewe to be presented as carcases of heifer, gilt and lamb in order to obtain a higher value for them.

Method and Materials

Most of the uteri were obtained from the Gorgie Abattoir, Edinburgh. The virgin uteri of pigs were obtained from gilts slaughtered for bacon and post gravid uteri were from animals sold as sows. Some sows' uteri from animals of known history were obtained from the Dryden Pig Breeding and Research Station.

The ox specimens were all from carcases of animals killed at the slaughterhouse as cows and heifers respectively.

The virgin uteri of sheep were from lambs and the post gravid uteri from ewes killed at the abattoir.

Method of Examining Arterial Supply to Uterus and Ovaries

The arteries in some specimens were dissected out, in others the arteries were injected with Vinylite* and then the soft tissues dissolved away with acid leaving a cast of the vessels.

It was found that the best method of demonstrating the vessels was to inject a suspension of Barium Sulphate (Fotogel)†, then, to take X-ray photographs of the specimen. It was noticed that by this method the distribution of the vessels supplying the uterus and ovaries could be demonstrated clearly, not only the vessels outwith the wall of the uterus but also those vessels embedded in the uterine wall.

The injection masses, both the vinylite and the fotogel, were forced by compressed air, at a pressure of approximately 250 m.m. of mercury, into the middle

* Vinylite Resin V.Y.H.H.—Bakelite, Ltd.
† Fotogel—Evans Medical Supplies, Ltd.

uterine arteries or one of the main branches of this artery (diagram illustrating the distribution of the main vessels supplying the uterus and ovaries, Fig. 1).

It was found unnecessary to wash out the arteries with warm normal saline, in fact it was better not to do so as the fluid diffused into the tissues causing the specimen to swell.

Findings

Pig

Gilt

Examination of the vascular supply to the virgin uteri of these animals reveals that the main branches of the middle uterine artery have straight courses in the broad ligament (Plate I). These branches on approching the uterine wall are connected by anastomosing arches. From these arches numerous small off-shoots run in a straight course prior to penetrating the uterine wall (Plate I). It should be noted in particular that these short vessels leaving the vascular arches are not coiled and that the small branches within the uterine wall show a very tight coiling. These arteries throughout their course in the wall of the uterus show a gradual curve towards the unattached border (Plate I).

Sow

The middle uterine arteries have a greater over-all diameter and more tortuous course than the corresponding arteries of gilts, and the short branches arising from the arches formed from the branches of the middle uterine artery become very coiled on approaching the wall of the uterus. The continuation of these vessels and their main offshoots in the wall of the uterus have a distinct loose coiling in contrast to the tight coiling of the corresponding vessels of the virgin uterus (Plate I).

Ox

Heifers

Very often the specimens from virgin heifers had the trunk of the middle uterine artery cut away. It was, however, possible to inject the branches through the largest remaining branch.

The numerous main branches of the middle uterine artery run in a straight course through the broad ligament. On approaching the attached border of the uterus further branching takes place and these offshoots are also straight, continuing in a comparatively straight direction within the valls of the uterus, until they terminate as intracotyledonary branches (Plate I). The several tightly coiled intracotyledonary branches from one or more of the intrauterine offshoots terminate in a grouped manner in the intracotyledonary area (Plate I).

Cow

The branches of the middle uterine artery within the broad ligament have a thicker wall, a greater over-all diameter, and are coiled more tortuously than the vessels of the virgin. These vessels immediately adjacent to the uterine wall become extremely tortuous and continue in this way in the wall of the uterus. The numerous terminal intracotyledonary branches are tightly coiled and run almost parallel with each other in a straight course towards the surface of the cotyledons (Plate II). V and VI).

Sheep

Lamb

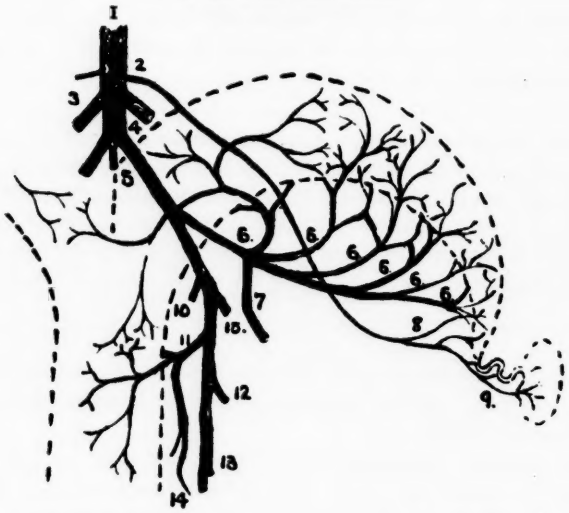
The main branches of the middle uterine artery are fewer than in the ox and pig. The branches from these vessels, given off close to the uterine wall, are short and comparatively straight and continue in this manner in the wall of the uterus. The intracotyledonary rami are fine and not numerous (Plate VII).

Ewe

The main arteries are coiled in the broad ligament and the branches of those near the attachment of the ligament to the uterus are short and very coiled. The intrauterine vessels are coiled and give rise to the tightly coiled intracotyledonary branches (Plate VIII).

FIG. 1

Diagram of the Anastomoses of the Arteries to the Ovary and Uterus



1. Abdominal aorta.
2. Utero-ovarian.
3. Ext. iliac.
4. Hypogastric or Int. iliac.
5. Middle sacral.
6. Middle uterine.
7. Umbilical.
8. Cranial uterine.
9. Ovarian.
10. Ilio-lumbar.
11. Caudal uterine.
12. Obturator.
13. Int. pudendal.
14. Perineal.
15. Cranial gluteal.

Discussion

As mentioned at the beginning of this paper, it has been our endeavour to help to differentiate between virgin uteri and post gravid uteri. This is important so that the carcase may be correctly valued.

We have shown by X-ray photographs and description the variation in vascularity between virgin and post gravid uteri. The branchings and arrangement of the vessels as described are not seen so readily in fresh uninjected specimens and

PLATE I

1.—Gilt. Approximately half life size

2.—Sow. Approximately quarter life size

3.—Heifer. Approximately quarter life size

4.—Heifer. Approximately quarter life size
Horn of uterus opened along unattached border
A—Cotyledon

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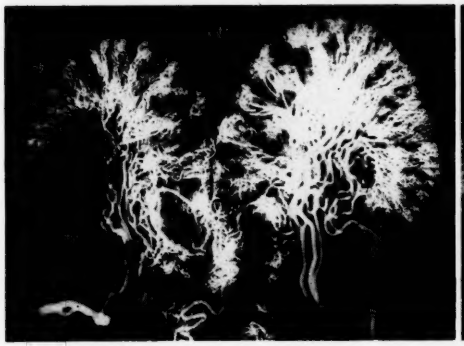
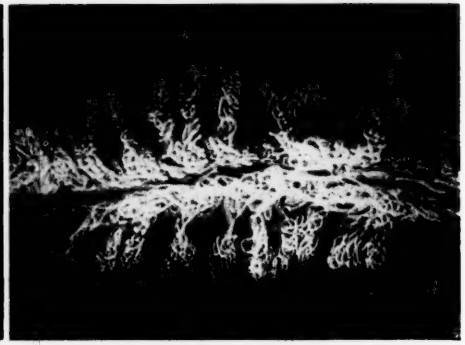
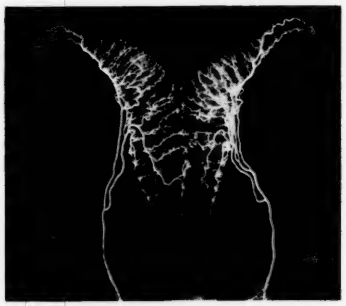


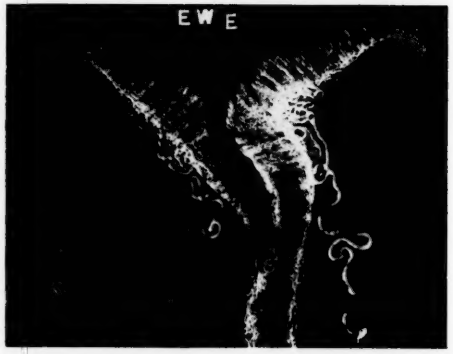
5.—Cow. Approximately quarter life size



6.—Cow. Approximately half life size.
Horn of uterus opened along unattached border



7.—Lamb. Approximately half life size



8.—Ewe. Approximately half life size

Article by Grahame and Morris on page 498

for that reason it has been suggested that a practical method should be described for applying the data given in this paper.

In the uterus of a gilt the vessels just outside the uterine wall should be straight and so should their continuations within the wall of the uterus. The arteries outside the uterine wall are seen quite easily but those within are very fine and only just visible to the naked eye. These vessels can be made more visible by gently stretching the walls of the uterus. This simple procedure may be applied to the uteri of all the animals examined to aid in the recognition and character of the vessels.

The arteries just outside the uterine wall in the sow are thicker and much more coiled than in the gilt. The intrauterine arteries are seen easily with the naked eye. They appear whitish in colour and tightly coiled.

The arrangement of the middle uterine artery in the heifer is not easy to see outside the uterus and it is better to cut open the uterus and examine the vessels within the cotyledons. This is done by cutting them open with a knife. In a heifer the vessels in the deep part of the cotyledons are small and have a fairly straight course. If the specimen is the uterus of a cow the deep vessels of the cotyledons are much larger and very coiled. After cutting the cotyledon if it is slightly stretched the vessels are observed more easily.

The large branches of the middle uterine artery of the lamb are visible running a straight course in the broad ligament of the uterus. The vessels within the uterine wall are very fine and difficult to recognise with the unaided eye. The intrauterine vessels of the ewe may be made more visible by stretching taut the wall of the uterus, the vessels appear whitish and the fine tight coiling is easily recognisable.

It should be emphasised that it is not wise to take into consideration the size of uteri unless all other factors have been taken into account.

Appreciations

We would like to thank Mr. John Norval through whose kindness we were able to obtain numerous specimens from the Gorgie Abattoir, Edinburgh, and also Dr. J. L. Hancock, Animal Breeding Research Organisation, for supplying uteri from sows of known history.

Our most grateful thanks to Mr. A. R. Withers for the excellent X-ray photographs, to Mr. Roberts, Chief Technician in this department, for the trouble he has taken injecting the specimens and to Mr. Hood for preparing the photographs for publication.

THE PATTERN OF THE ANSA SPIRALIS OF THE SHEEP COLON

(a) Does it change? (b) Is it influenced by the sex of the sheep?

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THE colon of the Artiodactyla is characterised by having part arranged to a greater or lesser extent in a spiral form. This part, the ansa spiralis, forms patterns varying with the different species and also within the species. If the loops of colon are arranged in centripetal and centrifugal coils with no deviations at all the pattern

is considered regular and can be classified according to the number of centripetal coils; if there is any deviation or a spiral cannot be recognised the arrangement is termed irregular. The patterns of the ansa spiralis of over a thousand (post-natal) sheep have been examined and the results of this survey (referred to here as the large survey) published elsewhere (Smith, 1955). There are at least two factors which could influence such a survey: (a) that the patterns change, (b) that they are sex-linked, each sex favouring certain patterns. It was decided that the best way to examine these possibilities was to carry out two further surveys and subject the data to statistical analyses. The work is divided into two sections, (A) that related to the constancy of the pattern, (B) the possibility of sex-linkage of patterns.

(A) Constancy of Pattern

Kolda (1931) found patterns of three centripetal coils in three young sheep and three and a half centripetal coils in four older sheep. He inferred that the pattern might be related to age. During a study of the development of the colon it was noted that after a certain stage (occurring in fœtuses of about 150-200 mm. crown-rump length) the ansa spiralis becomes fixed to the common mesentery and cannot be rearranged by manipulation. A group of fifty such fœtuses provides a sample of specimens at a stage of development far less advanced than any included in the large survey. If the frequency distribution of patterns is the same in the two groups it would appear unlikely that any change takes place once the ansa spiralis is fixed to the common mesentery.

Results

The frequency of the various patterns is shown in table 1. The first column describes the pattern, the second the number of fœtuses seen with that pattern, the third the number expected in a sample of that size if the distribution is exactly the same as in the large survey, and the fourth the value of Chi-squared for these figures.

With these data, P lies between 0.9 and 0.95. This indicates a remarkable similarity between the observed and expected frequency distributions and strongly suggests that there is no change in the pattern between the two stages. Thus it appears that the pattern of the ansa spiralis does not alter once it is fixed to the common mesentery, a stage of development occurring in fœtal life.

TABLE 1

The number of fœtuses seen with the different patterns of the ansa spiralis compared with the number expected if the distribution is exactly the same as in the large survey.

Pattern	Number of Foetuses		Value of Chi-squared
	Observed	Expected	
2 centripetal coils	1	0.09	0.0009
2½ - -	6	6.83	
3 - -	22	24.32	0.2213
3½ - -	9	8.15	0.0385
4 - -	0	0.28	
Irregular	12	10.32	0.2735

(B) Sex-linkage

As the large survey was spread over several months, the seasonal slaughter of sheep of different butchers' gradings had no effect on the results and one may assume an approximately equal distribution of sexes, since both are raised to slaughtering ages. A sample of a hundred male sheep was examined and the frequency distribution of the patterns compared with the data from the large survey. If certain arrangements were favoured by either sex a difference in distribution would be expected.

Results

The observations are displayed in table 2. The first column describes the pattern, the second the number of male sheep out of the survey of a hundred showing that pattern, the third the number expected in a sample of that size if the distribution is exactly the same as in the large survey, and the fourth the value of Chi-squared for these data.

TABLE 2

The number of male sheep seen with the different patterns of the ansa spiralis compared with the number expected if the distribution is exactly the same as in the large survey.

Pattern	Number of Male Sheep		Value of Chi-squared
	Observed	Expected	
2 centripetal coils	0	0.19	2.4776
2½ - -	8	13.67	
3 - -	55	48.63	0.8344
3½ - -	19	16.31	0.2662
4 - -	0	0.57	
Irregular	18	20.64	0.3377

With these figures, P lies between 0.2 and 0.3, indicating that there is not a significant difference between the frequency distributions of the groups.

As this sample of male sheep could thus represent a sample of the large survey it can be presumed that sex does not influence the pattern of the ansa spiralis.

Conclusions

It is unlikely that the pattern of the ansa spiralis of the sheep changes once it is fixed to the common mesentery, a level of development seen in the fœtus, nor does it appear to be influenced by the sex of the animal.

Summary

1. A survey of the various patterns of the ansa spiralis of the (post-natal) sheep colon may be subject to at least two possible influences, (a) that the patterns change, (b) that either sex favours certain patterns.

2. Statistical tests using samples of fœtal and male sheep show that it is not likely that either of these influences exist.

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THE USE OF ELECTROPHORETIC PATTERN OF BLOOD SERUM PROTEINS IN THE DIAGNOSIS OF TUBERCULOSIS IN BUFFALOES

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TUBERCULOSIS is one of the diseases most often encountered in Egyptian buffaloes. The records of the Egyptian Veterinary Department for 1948-1952 showed that the incidence of tuberculosis in buffaloes slaughtered in the Cairo abattoir during that period ranged from 4.7 per cent to 6.5 per cent.

Many investigators have studied changes in blood constituents during infection with tuberculosis. Johanson (1949) noticed an increase in the globulin accompanied by a decrease in the albumin in blood serum obtained from tuberculous rabbits. Similar results were obtained by Ewerbeck (1950) who used human blood serums.

Some cases have been reported where buffaloes with generalised tuberculosis (kept by the Animal Breeding Section of the Faculty of Agriculture) showed no reaction towards the tuberculin test; in most of these cases the infection was discovered in the slaughterhouse. This phenomenon was also observed in cattle by Boddie (1950). It is, therefore, necessary to devise a method by which the presence in a herd of such animals can be detected.

The work described in this paper was carried out in order to study the effect of tuberculosis on the electrophoretic pattern of blood serum proteins and albumin/globulin ratio. It was done in an attempt to find out if the results of such experiments could be of any value in the diagnosis of tuberculosis in buffaloes.

Materials and Methods

Animals

Animals used in these experiments were adult buffaloes bred by the Faculty of Agriculture and by the Ministry of Agriculture, Cairo. The animals were reared under almost identical conditions and had received a well-balanced diet.

After the intradermal tuberculin test had been carried out, seven of the buffaloes which gave no reaction were used to represent the healthy animals. Some of the tuberculin positive animals which were sent to the slaughterhouse were examined; twelve had pulmonary lesions and six were affected by generalised tuberculosis.

Blood Serum

Ten ml. of blood were taken from the jugular vein of each animal, left overnight at 1° C. and were centrifuged to separate the serum.

Paper Electrophoresis

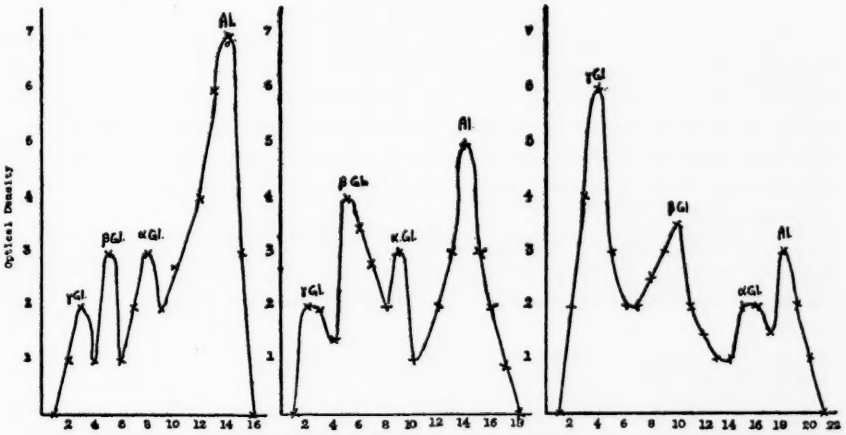
This was carried out according to the method described by Moustafa, Reda and Salem (1955), using a Shandon horizontal tank. Pyridine buffer at pH 6.7 was used and the protein bands were located after staining the paper strips with azo carmin dye (Durrum, 1950).

Typical electrophoretic curves were obtained as follows: Horizontal parallel lines were drawn, 0.5 cm. apart, across each paper strip; each of the small strips

obtained upon cutting along these lines was eluted with 5 ml. 0.1 per cent ammonium hydroxide and the optical density of the solution was then read in a Lumetron colorimeter using filter No. 490 M. The electrophoretic curve was obtained by plotting optical density readings against distance (Fig. 1).

FIG. 1

FIG. 1A FIG. 1B FIG. 1C



Distance (0.5 cm. between each strip)

Electrophoretic curves of serum proteins obtained from healthy and tuberculous buffaloes.

FIG. 1A. Healthy animals
FIG. 1B. Pulmonary Tuberculosis
FIG. 1C. Generalised tuberculosis

Al. = Albumin
Gl. = α Globulin
Gl. = β Globulin
Gl. = γ Globulin

Results

The results expressed as electrophoretic curves are illustrated in Fig. 1. It will be noticed that the serum of healthy buffaloes showed the presence of four serum protein bands, i.e. albumin, α, β, and γ globulins. Serum obtained from buffaloes with generalised tuberculosis contained lower amounts of albumin and higher amounts of globulin that of serum obtained from healthy animals. Such changes did not take place in serum obtained from buffaloes with pulmonary lesions only; there was a slight decrease in albumin accompanied by a marked decrease in the β globulin.

On eluting and evaluating the protein content in each of the bands produced on paper strips as shown before (Moustafa, Reda and Salem, 1955) the albumin/globulin ratio can be calculated. The results, which are summarised in table 1, show that the albumin/globulin ratio is much lower in tuberculous than in healthy animals and it is even lower in the serum obtained from buffaloes affected with generalised tuberculosis.

Table 1
Albumin/Globulin Ratio of Healthy and Tuberculous Buffaloes

Animals	*Average albumin/globulin ratio*
Healthy	0.88
Pulmonary tuberculosis ...	0.65
Generalised tuberculosis ...	0.14

Discussion and Summary

It is clear that the electrophoretic pattern revealed significant differences between the serum proteins of healthy and those affected with generalised tuberculosis. Paper electrophoresis appears, therefore, to have great possibilities for using in the diagnosis of tuberculosis in buffaloes, particularly those cases which, although generally infected, do not react towards the tuberculin test. Diagnosis of the latter cases is of great importance as these animals are a constant source of infection in the herd.

It appears possible that other diseases attacking buffaloes may induce changes in blood serum proteins similar to those obtained in this work. These diseases, however, usually show characteristic clinical symptoms.

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ANOMALOUS CLOSTRIDIUM WELCHII TYPE B STRAINS ISOLATED IN IRAN

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and F. ENTESSAR

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Clostridium welchii Type B is most frequently isolated from cases of lamb dysentery, and is characterised by the production of major lethal toxins α, β and ϵ, and the minor antigens θ, λ and μ (hyaluronidase). The sub-division of *Cl.welchii* strains into Types A, B, C, D and E is based on the major lethal toxins produced (Wilsdon, 1931; Glennys et al, 1933), the distribution of which is shown in the table. (The separation of Type F is based on other criteria (Oakley, 1949: Brooks, Sterne and Warrack, 1957).)

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TABLE
Distribution of major lethal toxins

Cl. welchii Type	Toxins produced			
	α	β	ϵ	ι
A	+	—	—	—
B	+	+	+	—
C	+	+	—	—
D	+	—	+	—
E	+	—	—	+

From the above table it will be seen that any strain which produces both β and ϵ toxins must be classified as Type B. This note is concerned with three β, ϵ-producing *Cl.welchii* strains in which the production of minor antigens did not follow the classical Type B pattern.

History

The three strains, HG 576, 32 and 277/27, were isolated in Iran and subsequently sent to the Wellcome Research Laboratories for typing. Strain HG 576 was isolated in April, 1954, from the intestine of a six-week-old kid belonging to a herd of 300 of similar age, a hundred of which died over a period of two weeks of a disease diagnosed as enterotoxæmia. There was no mortality among adult she-goats. Strain 32 was isolated in April, 1955, from the intestine of a young goat which had died of enterotoxæmia, near the village where strain HG576 was isolated. Strain 277/27 was isolated in July, 1956, from the intestine of an adult sheep, some twenty kilometers from the village where the other strains were isolated.

Examination for Antigen Production

The three strains were grown in broth containing meat particles, and Seitz-filtrates from six-hour cultures were examined for the production of soluble antigens by the methods described by Oakley and Warrack (1953). Supernatants of five-hour cultures in broth without meat particles were examined for the presence of θ toxin.

Results

All three strains were found to produce the major lethal toxins α, β and ϵ, and the minor antigens θ and κ. The production of κ, and the non-production of λ and μ (hyaluronidase) distinguish these strains from the classical Type B strains. Both κ and λ (Oakley, Warrack and van Heyningen, 1946; Oakley, Warrack and Warren, 1948) attack azocoll, a preparation of hide powder coupled with an azo-dye which is released when the collagen of the hide powder is attacked. The two antigens can be distinguished from each other (i) by the use of collagen paper which is disintegrated by κ but not affected by λ, and (ii) by the addition of κ and/or λ antisera to the filtrate at least thirty minutes prior to the addition of azocoll. (Both these methods were used in testing filtrates of the three strains). Typically κ is

produced by most strains belonging to Type A and D and by all Type C and E strains; λ is produced by Type B and E and some Type D strains.

The failure of the Iranian strains to produce μ (hyaluronidase) is in sharp contrast to the classical Type B strains which usually produce it in very large amounts.

Discussion

Although the three *Cl.welchii* strains described above were isolated at wide intervals and from two different animal species, they differ from the classical Type B strains in identical ways. Their assignment to Type B is unquestionable since they produce the major lethal toxins characteristic of that type. These Iranian strains appear to form a homogeneous group which may be an ecological sub-division of Type B. All three strains were isolated in such close geographical proximity that the possibility of their being a single strain, derived from a single source of infection, must be considered. The anomalous pattern of antigen production exhibited by these strains may be characteristic of all Iranian Type B strains, or the classical Type B may also occur in Iran. In this connection it should be noted that none of the three anomalous strains was isolated from a case of lamb dysentery, and that classical lamb dysentery as described in the literature, has not yet been seen in Iran.

Summary

Three strains of *Cl.welchii* Type B isolated in Iran were found to differ from the classical Type B strains in their production of κ and non-production of λ and hyaluronidase. Two of the strains were isolated from young goats and the other from an adult sheep.

Acknowledgements

We wish to thank Dr. A. Rafyi and Dr. M. Kaweh, of the Razi Institute, Teheran, and Dr. G. Harriet Warrack and Dr. M. Sterne, of the Wellcome Research Laboratories, for help in the examination of the Iranian Type B strains, and A. Tamadun for help in the isolation of two of the strains.

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EFFECTS ON FEEDING FURAZOLIDONE TO FOWLS

III. Observations on the subsequent effect on fertility and hatchability of feeding the drug at low levels from 4 to 18 weeks of age

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FURAZOLIDONE (N-[5-nitro-2-furfurylidene]-3-amino-2-oxazolidone) when fed continuously at levels of 0.005 to 0.02 per cent to Single Comb White Leghorn cockerels has been shown to depress the weight of the testes and produce histological changes in those organs which persist, in some cases, for at least 12 weeks after discontinuing the drug (Cooper and Skulski, 1955, 1956). Similarly, reductions in the size of testes and comb in 20-week-old White Rock cockerels, fed the drug at 0.066 per cent for 7 weeks, have been reported (Redman and Smyth, 1957). In turkeys which had been fed the drug from day-old to maturity at 0.011 per cent, sexual maturity was retarded by approximately one week, and in several males which did not produce semen during the experimental period the histological picture of the testes was similar to that of immature males. After sexual maturity was reached none of the treated groups differed significantly in respect to semen production, fertility or hatchability when mated to untreated females (loc. sit.).

In a continuation of earlier work, the following experiment was made to see if changes, produced by feeding the drug at low levels during the period 4 to 18 weeks of age, resulted in any subsequent effect on fertility and embryonic mortality when the treated males were mated with untreated females.

Randomized groups of 20 S.C.W.L. males four weeks of age were housed under similar experimental conditions as described previously (Cooper and Skulski, 1956). Furazolidone at 0, 0.01, 0.015 and 0.02 per cent w/w was added to the ration and the medicated food was fed during the period 4 to 18 weeks of age. Following discontinuance of the drug, the birds were fed the Station breeder ration.

At 3 and 9 weeks after discontinuing the drug, 5 birds from each group were destroyed; the testes were weighed and processed for histological examination. Sectioning was done singly and in some cases, serially. Sections were stained with hæmatoxylin-eosin and with Putt's carbol-fuchsin method for spermatozoa.

Eight weeks after discontinuing the drug, 6 males from each group were moved to individual cockerel cages. Four groups of 20 untreated S.C.W.L. pullets housed in slatted floored pens were used to provide eggs for fertility and hatchability studies. Each male was allowed to mate with the females for 3 or 4 days, following which he was replaced by a male of the same group. Rotation of males on this basis was carried out for a 12-week period, so that each male mated with the females on four separate occasions.

Eggs set once weekly in a forced-draught incubator were candled individually at 96 hours and tray-candled on the 18th day. All eggs appearing clear were opened and examined macroscopically for evidence of embryonic development.

Results

There were no significant differences in body weight of birds at 4, 8, 12, 16, 21 or 24 weeks of age.

Testes weights showed considerable variation within groups but no significant differences between groups. At all periods after discontinuance of the drug some histological changes occurred. These consisted mainly of disorder in the arrangement of cells in the seminiferous tubules together with partial or complete lack of spermatozoa, spermatids and secondary spermatozoa. In some cases this involved only a few single tubules but in other cases larger areas were involved. Interstitial tissue was increased in some cases.

Results of fertility and hatchability tests are shown in table 1. Only in the group which had been fed the drug at the 0.01 per cent level was fertility significantly lower ($P = <.02$), but since fertility in the groups fed the drug at 0.015 and 0.02 per cent did not differ from the control it is impossible to associate these effects with the drug alone. In the group fed the drug at 0.015 per cent a slightly higher percentage of embryonic mortality occurred which might suggest that the effect of the drug is manifested in an increased embryonic mortality, but again this effect was not consistent for all treatments.

TABLE 1
Fertility and Hatchability.

Treatment	Hatch No.	Eggs set	INF	EDG	DIS	Hatch	%F	%EDG	%DIS	%Hfert.
Controls	1 - 4	245	177	12	6	50	48.1	4.9	2.4	73.5
	5 - 8	327	36	18	19	254	88.9	5.5	5.7	87.3
	9 -12	274	59	18	26	171	78.4	6.5	9.5	79.5
	Total	846	272	48	51	475	67.6	5.67	6.0	82.7
+ 0.01% Furazolidone	1 - 4	248	240	2	2	4	3.3	0.8	0.8	50.0
	5 - 8	369	268	5	20	76	27.3	1.3	5.4	75.2
	9 -12	288	107	19	15	147	62.8	6.6	5.2	81.2
	Total	905	615	26	37	227	32.0	2.87	4.08	78.2
+ 0.015% Furazolidone	1 - 4	297	221	17	11	48	25.6	5.7	3.7	63.1
	5 - 8	391	115	28	51	197	70.6	7.1	13.0	71.0
	9 -12	318	40	16	59	203	87.4	5.0	18.5	73.0
	Total	1006	376	61	121	448	62.6	6.06	12.0	71.1
+ 0.02% Furazolidone	1 - 4	261	130	20	24	87	50.2	7.6	9.1	66.4
	5 - 8	389	121	16	43	209	68.9	4.1	11.0	77.9
	9 -12	325	71	15	21	218	78.1	4.6	6.4	85.9
	Total	975	322	51	88	514	66.9	5.2	9.02	78.7

INF = Infertile F = Fertile
EDG = Early embryonic mortality to 96 hrs. H. fert. = Hatchability of fertiles
DIS = Chicks dead-in-shell

Summary

Furazolidone was fed at 0, 0.01, 0.015 and 0.02 per cent to S.C.W.L. cockerels from the 4th to 18th week of age. After the drug had been discontinued 8 weeks, males from each group were mated (by rotation) to groups of 20 untreated pullets and fertility and hatchability determined for a 12-week period. Sections from testes

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of remaining males and from all males used in natural matings were examined histologically at various periods.

Some histological changes occurred, mainly in disorder in arrangement of cells, at all periods up to and including 20 weeks after the drug was discontinued. One group (0.01 per cent) showed depressed fertility and one group (0.015 per cent) showed a slightly higher incidence of embryonic mortality. Feeding of the drug at low levels produces histological changes in the testes which only return to normal after the elapse of a considerable time from the withdrawal of furazolidone. It is still open to question whether or not the depressed fertility or the incidence of embryonic mortality are directly related to the feeding of the drug.

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THE VALUE OF FÆCES EXAMINATIONS IN DETECTION OF CARRIERS OF SALMONELLOSIS IN GEESE

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SALMONELLA infections are widespread in birds such as turkeys, chickens, pigeons and ducks. There are, however, only a few reports of Salmonellosis in geese. Hinshaw, McNeill and Taylor reported in 1944 that geese are rarely infected with Salmonellæ. These authors reported *S.typhimurium* in 15 epidemics in chickens and 117 outbreaks in turkeys, but only one outbreak in geese and one in ducklings. Edwards, Bruner and Moran (1948) examined 12,331 paratyphoid cultures isolated from 47 animal species; they did not mention one from geese, although 4,007 strains were isolated from turkeys, 1,956 from chickens and 56 from ducks. Biester and Schwarte (1954) cite Manninger (1918), Fuller (1920), Weissgerber and Mueller (1922) on Salmonellosis in geese in East Prussia.

The goose industry has developed in Israel on modern lines, and Salmonellosis often occurs as an epidemic in goslings. Although 12 different types of Salmonella have been found in poultry in this country, only *S.typhimurium* has been isolated by Olitzki (1944) from outbreaks in geese.

The economic and public health importance of paratyphoid infections in geese warrants an investigation into the value of serological tests as indicators of carriers in geese.

Symptoms and Experimental

During an outbreak of a Salmonella infection in goslings on a local farm (the bacteriological diagnosis was performed by a diagnostic laboratory) we recorded the following observations:

The breeding flock consisted of about sixty geese, 1½ years old, with no visible signs of infection. The laying capacity was normal. The hatching percentage of their fertile eggs was less than 50 per cent as compared with two earlier hatches, which were between 65 per cent and 70 per cent. The eggs were incubated in a Petersime type incubator. Deaths occurred among the goslings three days after hatching and the mortality rate reached its peak on the 10th day of age. The losses thereafter diminished slowly and ceased after three weeks. Affected goslings were sluggish and refused food or ate very little, but they drank much water. Diarrhoea was observed in some birds and about 30 per cent. of 300 goslings died during the first three weeks. *Post-mortem*, the goslings showed paleness of the flesh and some birds showed a few necrotic foci on the livers. The body weight was light and many of the surviving goslings showed delayed development.

TABLE 1
Results of Agglutination Tests of Sera of Geese with a Seven Months Interval

Goose No.	First Tests of the Serum,						Tests of the Sera Made 7 months Later					
	S. typhimurium		S. telaviv		S. enteritidis		S. typhimurium		S. telaviv		S. enteritidis	
	H	O	H	O	H	O	H	O	H	O	H	O
1	200	100	200	500	200		50	100	200	50	0	100
2	200	20	200	100	200		200	0	100	100	50	50
3	0	0	0	0	200		10	0	0	50	0	50
4	0	0	0	10	200		0	0	50	50	0	100
5	0	0	0	50	200		-	-	-	-	-	-
6	50	50	50	10	200		0	0	100	10	50	50
7	0	0	0	20	200		10	20	50	50	50	100

0 = Negative in 1.10 suspension. — = Died during the test period.
Results Expressed as Reciprocals of Dilutions of Sera.

A few weeks later, we were asked to examine the sera of the mother geese in order to detect the carriers. Most of the sera showed agglutinins against *S.typhimurium* and *S.telaviv* but there was no evidence to show which type of Salmonella was involved in the infection of the goslings. We decided, therefore, to concentrate on a small number of birds for a more thorough serological and bacteriological examination. Seven geese of the flock were taken to the University animal house for further tests.

Serological tests were performed with suspensions designed to reveal antibodies against the H and O antigens of *S.typhimurium* and *S.telaviv*. *S.typhimurium* and *S.telaviv* were chosen since in earlier serological examinations, a great percentage of the geese showed agglutinins against these strains. Three of the sera (Nos. 1, 2 and 6) contained agglutinins against the antigens of *S.telaviv* and *S.typhimurium*, and these geese were therefore suspected of being carriers of these Salmonella.

Samples of fæces from each goose were enriched by culturing in Kaufmann-Mueller medium; after 24 hours they were sown on McConkeys medium and the results are shown in table 2; all seven geese revealed the presence of *S.enteritidis*. In no case were the suspected *S.typhimurium* or *S.telaviv* found. Serological examinations were then made with suspensions of *S.enteritidis* and we could confirm the existence of agglutinins against this type in all seven birds (table 1).

TABLE 2
Isolation of *S. enteritidis* from fæces of Geese.

	Goose No.						
Month's	1	2	3	4	5	6	7
Jan./Feb.	3/7	4/7	3/7	1/7	2/7	4/7	3/7
March	3/8	4/9	3/9	4/8	0/9	4/9	3/8
April	0/9	0/9	0/9	0/9	0/9	0/9	0/9
June/July.	0/14	0/14	0/14	0/14	-	0/14	0/14

Numerator = Number of positive results.
Denominator = Number examined.

During the first three months positive cultures were obtained in 30-50 per cent of the geese. All the micro-organisms were identified culturally and biochemically as *S.enteritidis*. From the fourth to the seventh month of the examination the situation was changed, and all tests were negative. Control tests with artificially infected fæces with approximately 200 micro-organisms per gram of fæces gave positive results.

According to these control tests there is no doubt that the negative results were not due to any errors in technique.

After seven months of continued examinations the sera of the birds were again examined for agglutinins and the results are summarized in table 1.

As seen in table 1, the sera of the birds showed appreciable quantities of agglutinins against the infective salmonella and against other types of salmonella as well. The geese were killed and bacteriological examinations of all internal organs, and of different parts of the intestines, were made. All tests were negative.

Conclusions and Summary

1. Agglutination tests with sera of geese for the detection of Salmonella carriers appear to be of negligible value, because agglutinins may be present against a number of Salmonella types. The results do not indicate whether the geese are carriers of Salmonella and do not give any indication of a definite Salmonella infection.

2. The isolation of the causative agent from the fæces establishes the carrier state.

3. The agglutinin titre against the infective type diminishes when the body has been cleared of the infection, which in this epidemic occurred spontaneously without therapy.

4. The susceptibility of geese to Salmonella infection appears to be equivalent to that of other birds. The scarcity of literature in this aspect of Salmonellosis, is

because, in most countries, geese are kept in small flocks and smallholders usually do not send material to the diagnostic laboratories.

Acknowledgement

The writers are indebted to Professor L. Olitzky of the Hebrew University, Jerusalem, for interest and criticism

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OBITUARY

Dr. William Morgan Scott

DR. SCOTT died on the night of Friday, October 11, at Wembdon Lodge, Bridgwater, the home of his son. He was 86 years of age. He suffered from a sudden heart attack some days previously and was moved from his own home, Fryern Hall, so that he could be under more constant care and supervision. Until the heart attack occurred he had been active in his practice and remarkably fit and well considering his great age.

Wm. Scott was the son of John Scott, of Fala Hall, Midlothian. He was educated at St. George's School, Edinburgh, and at the Royal (Dick) Veterinary College. He graduated as a M.R.C.V.S. in May 1894 and took the F.R.C.V.S. in December 1899. He held a junior post in the " Dick " College for a short time and then went to Bridgwater as assistant to Mr. Ware. On the death of Mr. Ware he took over the practice and continued to work in Bridgwater up to the time of his illness, a period of over sixty years. He was an extremely competent veterinary surgeon and right up to the end he was imbued with the spirit and inquisitiveness of a student. He was progressive in outlook, was well informed on veterinary literature and on all new discoveries that appertained to his profession. Many years ago when bacteriology was in its " golden days " and achieving full recognition in the medical sphere he appreciated its potential value in the veterinary field and sought to increase his knowledge. He made contact with Sir Almroth Wright and became his disciple. He studied under Sir Almroth and collaborated with him in work in the field. Scott fitted up a laboratory at Fryern Hall and worked in it every hour that could be spared from his busy practice. This meant that for many years he burnt the " midnight oil ".

Working with Sir Almroth, Scott, like all disciples of that great man, soon became an enthusiastic supporter of vaccine therapy. He made vaccines and used them with great success in his own practice and it was not long before veterinary colleagues were asking for his help and advice in the matter of vaccine therapy.

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He made autogenous vaccines for many of his colleagues and good results were reported from all parts of the country. He wrote a book " Clinical Bacteriology and Vaccine Therapy for Veterinary Surgeons ". The text was lucid and there is no doubt that in its time it did much to disclose some of the mysteries of bacteriology and to explain the theories and principles of vaccination to the ordinary veterinary surgeon. Scott was the victim of much vicious criticism especially from the orthodox laboratory workers who were loath to accept that a practising veterinary surgeon could become proficient in bacteriological technique. Sir Almroth thought otherwise and wrote a foreword for the book.

Scott's literary efforts were not confined to bacteriology. He was an acute observer, he kept records of his cases and he was a very frequent contributor to the veterinary press. His range was wide and his publications covered surgical and medical problems met with in the course of his daily work. He did not hesitate to enter into discussions on political and social topics and there are many who will remember his vigorous reaction to the use of the appellation " Vet ". He was the author of another useful book " An Indexed System of Veterinary Treatment " which met with a very favourable reception. He collaborated with the late Wallis Hoare when the latter was editing and compiling his two-volume " System of Veterinary Medicine ". He assisted Hoare also when the latter was gathering material for the book " Veterinary Therapeutics ". The two books achieved a " classic " reputation and for many years ranked as standard textbooks for students and practitioners. In the course of his bacteriological work Scott became very interested in actinomycosis in cattle and for his work in this field he received the Doctorate of Veterinary Medicine of the University of Zurich. He received the recognition of the Royal Society of Edinburgh and was elected a Fellow of that learned body. He was a Fellow of the Royal Society of Medicine and of the Royal Microscopical Society. There can be no doubt that Scott's academic capacity and attainment were on a very high level and it was all the more creditable and remarkable because he achieved this status by his own endeavour. He was constant and enthusiastic in search of knowledge and he never became " dated " for he kept abreast of all the advances in medical and veterinary science. In the field he was a keen observer and an able diagnostician and he was often called to give a second opinion by colleagues when they were in doubt or trouble.

Dr. Scott did not believe that the best of life came by following the precept of all work and no play. Despite his intense concentration on professional matters he found time to live a full social life. He was a popular member of the " Bohemian " Savage Club and often on a Saturday night he might be seen joining in all the fun of those unique masculine occasions when actors, artists, authors and scholars " let their hair down ". He was a devoted Knight of the Round Table and held office as Knight Constable and Master of the Horse in that distinguished body. He was fond of foreign travel and he had visited most of the European and Mediterranean countries and North America and he had many friends in those parts. This stood him in good stead when he was in danger of being stranded in southern France in 1939 and incidently enabled him to come to the rescue of other people who were in similar plight.

Scott was a man who attracted attention in any company. He was tall and spare of superfluous flesh and he carried himself with a distinguished air. His fine-cut features, flowing "cavalry" moustache and courtly manner were those of an old-time aristocrat and commanded attention whatever the place or company. Sixty years in Somerset did not dispel his Scottish tongue and his joy in quoting Robert Burns. He was always turned out well and according to the occasion, albeit in a somewhat Victorian or Edwardian "Dandy" style. The many changes in the mode of dress left him unmoved and he lived to see that which he favoured come in again. He wore a grey bowler or beaver hat with a very curled brim and a deep "Gladstone" collar with cravat. His suits were of a country sporting style and he favoured a well-checked pattern. To take a walk with him in one of the London parks on a Sunday afternoon was something to be remembered for he attracted as much attention as the late Sir Walter Gilbey. People would make way for him and gaze upon him, artists would sketch him, and there must be many homes with a snapshot photograph of this apparently "old time" gentleman. He was sharp of tongue and had a very sarcastic wit and he used both without fear or favour, as many men who had accidently impeded his passage have cause to remember. On one occasion a particularly querulous radio artist turned and whipped Scott with biting sarcasm. His attempt elicited an immediate response which proved beyond a shadow of doubt that the artist was only a novice in the art and use of blistering speech. He was deflated and discredited and bereft of response, to the joy of those around. There is one story that must be told for it records an occasion when Scott was nonplussed. It happened many years ago and relates to the days of the *Veterinary News*, a weekly periodical, and Henry Gray, the Editor. Scott thought to do a good turn for his old friend Gray by supplying him with "hot" news so that Gray could be one jump ahead of the *Veterinary Record*. Scott was President of the Western Counties Society and he had prepared his Presidential address. He sent a copy of the proposed address to Gray. Unfortunately Gray published it in his next edition which came out almost a week before the date on which the address was to be given.

Wm. Scott was unique, he attempted great things, for he always aimed high and he accomplished much. No account would be complete without reference to his partner for many years, his wife. Theirs was an ideal marriage and she helped and encouraged him in every way. She would sit with him in study or laboratory until the early hours, ever at hand to help if required, making notes and assisting in the writing up. Her death was the greatest blow of his long life and it bowed him low, but he was a man of deep faith and throughout his many lonely years he was (as he said) comforted and fortified, for he was conscious that she was still forever by his side to guide his way until their reunion.

Such devotion must be born of Truth.

The funeral was on Wednesday, October 16. The service was held at St. Mary's Church, Bridgwater, and the committal at Wembdon Road Cemetery. The large congregation which gathered to pay their last respects included representatives from the profession, the Ministry of Agriculture and many local bodies and associations, a manifest token of the great esteem which Dr. Scott had earned by his life and work.

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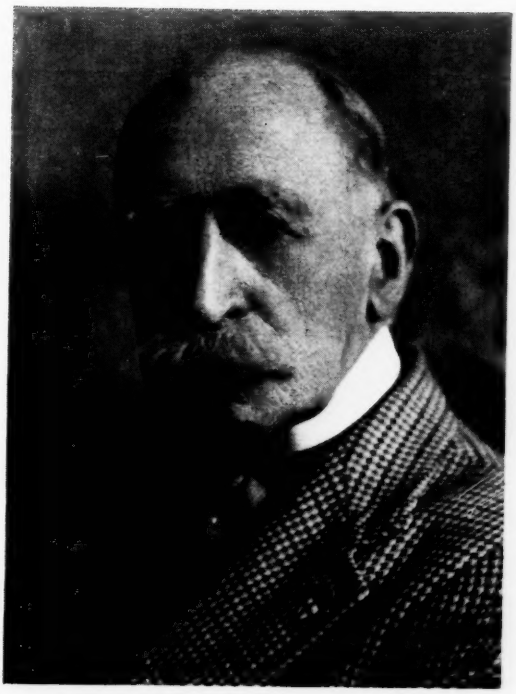

Photo by F. W. Wilkins, Bridgwater

Dr. William Morgan Scott

REVIEWS

INFECTIOUS DISEASES OF ANIMALS, by W. A. Hagan, D.V.M., D.Sc., and D. W. Bruner, D.V.M., Ph.D. Third edition, xx + 968 pages. 171 illustrations. London: Baillière, Tindall & Cox, Ltd. 84s.

THIS is the third, revised, edition of an excellent textbook which already has achieved wide popularity in this country. The various chapters give accounts of the important infectious diseases of domestic animals—not restricted to those occurring in the U.S.A.—due to bacteria, fungi, protozoa or viruses. Emphasis is placed on the ætiological agents—what they look like, where they live, how they may be identified in the laboratory, how they enter the body and cause disease naturally or experimentally, how they are transmitted to other animals, and how they may be combated by way of preventive or therapeutic measures. Attention is given to clinical and pathological features, and methods of diagnosis, so that, while the book is not a complete textbook of bacteriology or pathology it should be very useful for laboratory as well as field workers. There are some useful lists of references at the end of each section.

Some few criticisms might be made. The illustrations, for example, are not always specially clear. One surprising misprint is "pruritis" (p. 942, 943). The name of Brooksbank appears wrongly as Brookshank (pp. 90, 91). There is confusion as to whether erysipeloid in man is a suppurative (p. 164) or a non-suppurative (p. 171) condition. The authors are unaware of the reports of the isolation of *B.actinoides* from bovine pneumonic lungs in this country (p. 421). The belief that *Cl.welchii* type D is the cause of grass sickness in horses is hardly worthy of mention (p. 396), and there is no strong reason at the moment for including transmissible venereal tumours of dogs amongst the lesions caused by virus disease (p. 711): the status of the agent responsible for "strawberry footrot" (p. 714) is rightly implied to be still uncertain. Once again Lovell's work on *C.pyogenes* is overlooked in an American work (p. 144).

Despite its price, the book can be recommended firmly both to veterinary students in their pathology and medicine courses and to practising veterinary surgeons.

FARMER & STOCK-BREEDER YEAR BOOK AND DESK DIARY, 1958. London: Farmer & Stock-Breeder Publications. Size 11½ in. × 8½ in. 358 pages. Price 15s. (including 2s. 9d. P.T.). Postage 1s. 9d. Laminated boards—quarter bound.

THIS coming year, the 1958 Farmer & Stock-Breeder Year Book and Desk Diary will again prove an invaluable aid to better farming. It includes a remarkable reference section containing 48 pages of pictures and a really useful desk diary. There is plenty of space for notes, addresses, and telephone numbers.

The Reference Section includes addresses and personnel of official bodies; marketing boards, livestock societies, A.I. centres, agricultural organisations, grants and subsidies, rations for stock, compensation, foodstuffs and fertilizers, principal shows, pedigree sales, buyers' guide and other essential information.

Superbly produced, fully indexed for quick and easy reference, the Farmer & Stock-Breeder Year Book and Desk Diary, 1958, is a mine of information.

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NOTICES

POULTRY ASSOCIATION OF GREAT BRITAIN—the National Poultry Association of the United Kingdom has changed (from December 15) its London (England) address from Wigton House, 206 St. John Street, London, E.C.1, England, to *The Poultry Centre, 19 Compton Terrace, London, N.1, England.*

MESSRS. A. & G. NICHOLAS, LTD., of Slough, are able to announce that their preparation "Megimide Sodium" which has been devised for the termination of barbiturate anæsthesia is available now to the members of the veterinary profession. Megimide has passed severe tests in the laboratory and in the field and veterinary surgeons will find it of great value in their surgical work. Enquiries are invited, direct or through the usual channels.

NEWS

Agricultural Research Council

Institute of Animal Physiology, Babraham, Cambridge
Appointment of Director

THE Agricultural Research Council announce the appointment of Professor J. H. Gaddum, M.A., Sc.D., M.R.C.S., L.R.C.P., F.R.S., F.R.S.E., as Director of their Institute of Animal Physiology, Babraham, Cambridge, as from September 30, 1958, when Dr. I. de Burgh Daly, M.A., M.D., F.R.C.P., F.R.S., the present Director of the Institute, will be retiring on age grounds.

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